FAT MASS MEASUREMENT APPARATUS

TECHNICAL FIELD

This invention relates to fat mass measurement apparatuses, and particularly relates to fat mass measurement apparatuses that measure a fat mass in an abdominal area of a measurement subject.

BACKGROUND ART

A body fat measurement apparatus that uses an impedance measured between multiple electrodes affixed to measurement areas of a body to calculate a body fat distribution across a cross-section of the areas where the electrodes are affixed has been disclosed in, for example, Patent Literature 1 (JP H11-113870A) and Patent Literature 2 (JP 2005-288023A).

SUMMARY OF INVENTION

To accurately diagnose endocrine/metabolic system-related risks, it is desirable to measure a fat mass, and more specifically, to measure the volume of fat in the abdominal area. However, although body fat measurement apparatuses disclosed in Patent Literature 1 (JP H11-113870A) and Patent Literature 2 (JP 2005-288023A) do calculate a body fat distribution across a cross-section of the areas where the electrodes are affixed, these apparatuses do not calculate the volume.

Measurement that uses a tomographic image of the abdominal area obtained through X-ray CT (computed tomography) exists as another conventional method for measuring the fat volume in the abdominal area. In this method, tomographic images of the abdominal area are captured in multiple areas, and the area of the fat in the image is geometrically calculated from the respective multiple abdominal area tomographic images, after which the calculated areas are integrated to obtain a fat mass (volume); the measurement has thus taken a long time.

It is also possible to capture the same type of tomographic images of the abdominal area as X-ray CT using MRI (magnetic resonance imaging), but measurement of a fat mass (volume) takes a long time in this case as well. Moreover, oversized equipment is necessary when using X-ray CT or MRI, and thus such methods are inefficient.

Therefore, one or more embodiments of the present invention provide a fat mass measurement apparatus capable of efficiently measuring a fat mass at a predetermined area of a body.

A fat mass measurement apparatus according to one or more embodiments of the present invention is an apparatus that measures a fat mass in a body based on a body impedance measured by bringing impedance measurement electrodes into contact with a measurement subject's body surface.

According to one or more embodiments of the present invention, the fat mass measurement apparatus includes: a position detection unit for detecting a predetermined position in a trunk area of the measurement subject; an area detection unit for detecting a predetermined area in the trunk area using the position detected by the position detection unit; an electrode position setting unit for setting, on the body surface at the predetermined area detected by the area detection unit, a plurality of positions along the vertical direction of the trunk area for measuring the body impedance; an impedance measurement unit that measures the body impedance by bringing the impedance measurement electrodes into contact with each of the plurality of positions set by the electrode position

setting unit; and a fat mass calculation unit for calculating a fat mass of the predetermined area based on the body impedances at each of the plurality of positions measured by the impedance measurement unit and the size of the trunk area at the predetermined area.

According to one or more embodiments of the present invention, a fat mass at a predetermined area can be measured efficiently.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is an external view of a fat mass measurement apparatus according to a first embodiment of the present invention.

FIG. 2 is an external view of an electrode mat according to the first embodiment of the present invention.

FIGS. 3A and 3B are diagrams illustrating a functional configuration of the fat mass measurement apparatus according to a first embodiment of the present invention.

FIG. 4 is a diagram illustrating an example of the arrangement of electrodes according to the first embodiment of the present invention.

FIG. 5 is a diagram illustrating a procedure for calculating a fat volume in an abdominal area according to the first embodiment of the present invention.

FIG. 6 is a flowchart illustrating a measurement process according to the first embodiment of the present invention.

FIG. 7 is a flowchart illustrating the measurement process according to the first embodiment of the present invention.

FIG. 8 is a diagram illustrating another method for detecting a predetermined location in a trunk area according to the first embodiment of the present invention.

FIG. 9 is an external view of a fat mass measurement apparatus according to a second embodiment of the present invention.

FIG. 10 is a diagram illustrating a frame member, an electrode support member, and a connection state between the two according to the second embodiment of the present invention.

FIG. 11 is a diagram illustrating the frame member, the electrode support member, and the connection state between the two according to the second embodiment of the present invention.

FIG. 12 is a diagram illustrating the frame member, the electrode support member, and the connection state between the two according to the second embodiment of the present invention.

FIGS. 13A and 13B are diagrams illustrating a functional configuration of the fat mass measurement apparatus according to the second embodiment of the present invention.

DETAILED DESCRIPTION OF INVENTION

Embodiments of the present invention will be described in detail hereinafter with reference to the drawings. Note that identical or corresponding areas of the drawings will be assigned the same reference numerals, and descriptions thereof will not be repeated.

In the embodiments, "trunk area" refers to the trunk portion of a body. "Abdominal area" refers to the trunk area aside from the chest area, and serves as an abdominal area fat mass measurement area. In the embodiments, the abdominal area fat mass measurement area refers to an area from the twelfth rib to the ilium. An "area distanced from the abdominal area" includes the upper limbs, consisting of the upper arms, forearms, wrists, and fingers, and the lower limbs, consisting of the thighs, calves, ankles, and toes. "Body axis" refers to an